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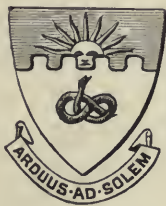
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BY
HERBERT BOLTON, F.R.S.E., (1863-)

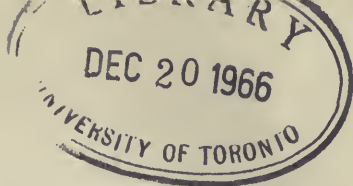
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THE NOMENCLATURE OF THE SEAMS OF THE
LANCASHIRE LOWER COAL MEASURES.

BY HERBERT BOLTON, F.R.S.E.

Read before the Manchester Geological Society, January 28th, 1898.

(*Trans. Manchester Geol. Soc., Part XVI., XXV.*)

INTRODUCTION.

The history of this, the Manchester Geological Society, has been in the past bound up with the progress of knowledge of the Lancashire Coalfield.

Its members ought to be, more than any other body of men, most concerned with its continued study and development.

It seems therefore most fitting that this communication should be laid before the Society. Another reason why this paper is laid before you is that the papers of Hall, Looney, Binney, Wild, and Dickinson, and many others recorded in the Society's Transactions, have alone rendered it possible to determine the nomenclature of the coal seams with any measure of success.

The causes which have rendered the preparation of this paper necessary are two ; first, the necessity of determining what name out of all those now in use for a single seam should be printed upon the labels of the Manchester Museum when the horizon from which a fossil was obtained is known.

Secondly, it seemed desirable to precede the printing of any one term by the publication of all other terms which may have been or are still in use.

By this means, if a name has been selected which is not familiar to a visitor, a glance at the list of what we consider synonyms will probably tell him whether it relates to a seam of coal he knows by one of the synonyms.

That a coal seam has many names is known to all of you, as well as the fact that the multiplicity of names proves a serious obstacle to investigations upon the persistence, characters, and development of the measures as a whole.

It is even a more serious obstacle to the palæontologist who, being led to assume that two coal seams in different districts are identical because they bear the same name, may, when dealing with the fossils obtained from each, give to those fossils a wider geographical range than they really possess, and also confuse the fauna and flora of one horizon with that of another below or above it.

When an author makes use of a name already in use for more than one coal seam, it naturally follows that readers of his paper assume that the coal seam alluded to is the one *they* know by that name, unless it happens that the particular seam is distinguishable by other means.

That the nomenclature of the Lower Coal Measures has been uncertain for fully three-quarters of a century we know from Binney, who in 1839 (*Trans. Manch. Geol. Soc.*, vol. i., p. 77, 1841,) gave three names to the Gannister coal, all of which were then in use.

Two of the three terms given by Binney ("Rabbit" and "Mountain Mine") were known to Elias Hall, and used by him in his "Introduction to the Mineral and Geological Map of the Coalfield of Lancashire," Manchester, 1836, p. 8.

The third term "Gannister" was known to both Elias Hall and Francis Looney, but was only used by them for the grit rock underlying the coal (*op. cit.*, pp. 8 and 27).

The trivial names of "Rabbit" and "Mountain Mine" came into use from the circumstances of the coal being generally worked by levels on the hill sides. (Binney, *Trans. Manch. Geol. Soc.*, vol. i., p. 77.)

One reason, and perhaps the chief, why numerous names have come into use for one coal seam can be found in the conditions under which the Lower Coal Measures occur. A study of the conditions of life in the upland hamlets of Lancashire during the early part of the century may supply another.

The Lower Measures flank the richer middle series throughout the county, and in the northern, eastern, and western areas rise up into moorland hills intersected by narrow valleys.

The coal seams of the Lower Measures crop out in most cases along the flanks of the hills, or even on the summits, hence the use of terms such as those of Elias Hall and Binney, or of such a term as "Pasture Mine" given to a seam of coal high up in the Lower Measures, which from its position was most likely to be found only on the hills, or along the belt of rough grazing ground called "pastures," which usually separates the grass-land from the moorlands above.

The conditions of life half a century ago were of such a character that local names for coal seams were not only very general, but unavoidable.

The districts were sparsely inhabited, the hill-sides being occupied by widely separated grazing farms, with here and there a small cluster of houses of handloom weavers.

Communication almost everywhere was by means of bridle-paths and "pack-horse roads." Of the inhabitants of one valley and its hill-sides, hardly more than one member was in constant touch with the outer world. A knowledge

of what was being done in adjacent valleys or elsewhere was only gained by a long toilsome journey over the moorlands, or by brief conversations between the handloom weavers as they met at long intervals at the house of the cloth master when they delivered a finished piece of cloth, and received a new warp with which to trudge home, and there continue their work.

The farmers often had the right expressly stated in their leases of mining the coal and rock upon their farms or on the moorland above.

Whether they had it or not, however, adits were driven along the line of outcrop of all the chief seams, and the work carried inwards until the collapse of roof or sides, or the accumulation of water led to abandonment and a new excavation elsewhere.

A name was required with which to designate the coal seam worked, and from want of knowledge of the occurrence of the seam elsewhere, or of a name already in use, a local or trivial name was adopted. Certain examples of these names have already been given, but a still better one is that of "Spanish-juice Coal"* of Mr. John Hall,† a name given by him to the Lower Foot Coal, on account of the resemblance of its fracture to that of a stick of "Spanish juice."

The most fertile source of terms, and we may add of confusion also, has arisen from the fairly general practice of miners and others of designating a coal seam by its thickness as known to them. One result of this has been to

* "Spanish juice" is a black asphaltum-like compound of liquorice breaking with a conchoidal fracture. When boiled with senna leaves and uncrushed linseed, it formed a decoction still held in North-East Lancashire as a valuable specific for cold and bronchial troubles. Mr. Hall, who was eighty years of age when he conducted an excursion of this Society in 1860, and pointed out his "Spanish Juice Coal" to Mr. Binney, was probably as well aware of the qualities of the emulsion as of its characteristic fracture.

† *Trans. Manch. Geol. Soc.*, vol. ii., 1860, p. 87.

create "Yard Mines" in plenty, until the term is now absolutely meaningless. The well-known "Bassy" or "Salts Mine" of Hall, is the "Lower Yard Mine" of Saddleworth and Rochdale, but it is not the "Dirty Yard Mine" of Oldham, which is the next seam above, nor is it the "Yard Mine" of Bacup, for the latter is the Gannister Coal, whilst the "Yard" or "Mountain Mine" of Over Darwen is the 40 Yards or "Upper Mountain Mine." Similarly the "Yard" and "Thin" seams of Huddlesden Colliery, and the "Yard Mine" of Oswaldtwistle are not the equivalents of the first "Yard Mine" mentioned here, but are held by Mr. Dickinson to represent the "40 Yards" or "Upper Mountain Mine."

The confusion resulting from the use of the word "Yard" is even greater in the case of the Middle Coal Measures, and taking into account the ever-varying thickness of coal seams, and the degree of confusion already existing, it seems better to discard all such terms in the future, and drop as far as possible those already in use.

The thickness of strata which intervene between one coal seam and another has at times been taken advantage of as the name of a coal seam, and whilst the same arguments can be used against names of this character as in the previous case, these names are of greater value in that they indicate the amount of local sedimentation which took place between the formation of one coal and another, and where the name becomes incongruous by reason of an increase or decrease in thickness of the intervening beds, the incongruity serves to emphasise a point often lost sight of, *i.e.*, the direction from which sediments were brought, and the changing character of those sediments when traced over great distances. The "40 Yards" Coal, or "Upper Mountain Mine," is a good example of such a seam as we have described.

Its position is fairly constant, about forty yards above the

Bullion Mine over a wide district, hence the term is well known. At Billinge, however, the two seams are separated by over eighty yards of flags and shales (Hull, *Geol. Surv. Mem.*, "Geology of the Country around Wigan," p. 9, 1862), and the same occurs at other places as at Stalybridge.

It is now a general rule in all scientific writings to adhere to a somewhat rigid interpretation of what has been called the law of priority. Where it can be shown that an author gave a definite name, not already preoccupied, to a species, and sufficiently defined that species, so that it can be recognised by his description or illustration, the author's name is retained, and other names which may have come into use later, from various causes, are regarded as synonyms, and dropped even though they may be in general use.

The determination of synonymy of the many names given to coal seams is a hazardous task, owing to the obscure origin of many of them. Most frequently, names of coal seams have appeared for the first time in literature under circumstances which indicate that they were already in general use. It is therefore not by any means certain that a name owes its origin to the writer who first published it.

The earliest name given to a seam in the Lower Coal Measures seems to have been that of "Mountain Mine," which was in general use in 1836, when Hall published his geological map, and "Introduction." The term was apparently restricted to the chief coal seam of the series, but from that time on to the present the meaning of the term has extended until the term "Mountain Mine" may mean any of the coals of the Lower Measures.

The term "Mountain Mine" was applied by Hull (*Geol. Survey Memoir*, "Geology of the Country around Wigan," p. 9, 1862) to the coals of the lower measures so early as 1862.

In a similar way the term "Gannister" first used by

Phillips for the grit rock underlying the coal we have just spoken of, was also given to the coal itself, which thus became the "Gannister Coal" of Binney in 1841. (*Trans. Manch. Geol. Soc.*, vol. i., p. 77.) The term "Gannister" was afterwards extended by other writers to the whole of the Lower Coal Measures, so that in 1862 we find Hull writing in the *Geological Survey Memoirs*, of the "Lower Coal Measures or Gannister Beds." (*Op. cit.*, p. 9.)

An example of an opposite kind, where a general term has become specialised to one seam, is seen in the use of the term "Rearing Mine."

In 1837, Mr. James Heywood used the word as a general term applied throughout the coalfield to steep mines. (Jas. Heywood, *Brit. Assoc. Report*, Liverpool, 1837, p. 78, and *Proceedings of the Literary and Philosophical Society of Manchester*, 1837, p. 426).

Its use as a general term in the Burnley district is mentioned so lately as 1875 (Hull, *Geol. Survey Mem.*, "Geology of the Burnley Coalfield," p. 65,) yet Mr. Binney in 1860 used it as strictly applicable to the "Mountain Four Feet," or the united Gannister and Bullion Mines (Binney, *Trans. Manch. Geol. Soc.*, vol. ii., p. 76.)

The utility of these early names was diminished by laxity of use, and it is therefore not surprising to find that in process of time qualifying prefixes were added to each of the general terms in order to indicate more clearly what seams were meant. In this way arose such terms as Upper, Middle, and Lower Mountain Mines; Upper and Lower Foot Mines, &c.

Any attempt to set up the older terms would end in failure, because they were not sufficiently distinctive of any one seam.

It would seem much better, and certainly is more feasible, to advocate the retention of the modified older terms which

are now fairly well understood, re-defining their meaning and application, and strive to extend their use, and the abolition of all other terms now applied to the same seams.

COAL SEAMS CONSIDERED IN DETAIL.

FIRST COAL. Hull, 1864.

1841.—*A nine-inch coal* resting upon a shale floor a yard in thickness, and immediately above the Rough Rock. Locality not stated. Binney, *Trans. Manch. Geol. Soc.*, vol. i., p. 78.

1860.—“At a distance of ten yards above the Feather Edge Coal is a *little coal of ten inches*.” Occurring near Barlow’s-o’th-Coal Pits in Pilsworth; “by the side of the turnpike road half-way between Bury and Middleton; at Boar Edge, near Bury; and on Wetley Moor, Staffordshire.” Binney, *op. cit.*, vol. ii., pp. 80, 81.

1860.—*Foot Coal* of Binney, ten inches in thickness, lying about eight yards above the *Feather Edge Coal* at Boar Edge, near Bury. Binney, *op. cit.*, vol. ii., pp. 87 and 88.

1862.—*Foot Coal of Dulesgate*. Binney, *op. cit.*, vol. iii., p. 327.

1864.—“At Wolstenholme . . . there is a *coal about nine inches thick* which lies about twelve yards above the three-quarters (Feather Edge or Sand-rock) Mine.” Dickinson, *op. cit.*, vol. iv., p. 161.

1864.—*First Coal of Turf Hill and Stalybridge*. “This little seam occurs immediately above, or within a few feet of the Rough Rock.” “It may be seen in a lane and brook-section, at a hamlet called Binns, east of Tunshill. Here, indeed, there appear to be two thin seams, . . . the upper 18 inches, the lower 6 inches in thickness.” Hull, *Geol. Surv. Mem.*, “Geology of the Country around Oldham,” pp. 16, 17. “At High Thurston Clough, and Wall Hill, near Dobeross.” *Op. cit.*, p. 17.

1864-5-6.—*A thin coal (Swinden Coal)* of inferior quality, lying above the Rough Rock. It has been worked on Great Edge, in the Swinden Valley, where it is 18 inches in thickness. J. Whitaker, *Trans. Manch. Geol. Soc.*, vol. v., p. 96.

1875.—*A ten inch coal* seen in a brook course, east of Hurst House, Delf, Heskin, in the Chorley District. Hull, *Geol. Survey Mem.*, “Geology of the Burnley Coalfield,” p. 91.

1875.—*A four inch coal over Rough Rock in Cliviger Section of the Lower Coal Measures. Op. cit., p. 55.*

1886-7-8.—“*Ten inches of coal seen on Brandwood Moor, near Stacksteads, just above Brierley's Coalpit.*” C. Dugdale, *op. cit.*, vol. xix., pp. 221, 227.

1890-1-2.—*First Coal of Hull*, quoted by G. Wild, *Trans. Manch. Geol. Soc.*, vol. xxi., p. 375. Described as “Foot Coal” in General Section of Lower Coal Measures. *Op. cit.* p. 394.

NOTE.—*The Lower Early Banks Mine* of Stalybridge and Hough Hill, mentioned by G. Wild, and doubtfully correlated by him with the Feather Edge Mine, may possibly represent this seam and the overlying Bassey Mine. See G. Wild, *Trans. Manch. Geol. Soc.*, vol. xxi., plate facing p. 394.

This seam, which forms the true base of the Coal Measures, has oddly enough failed to receive a name which can be at all regarded as distinctive.

The seam was well known to Binney, who gave it a place in his general section of Lancashire strata. By him it was generally described as a “foot coal,” but the term was descriptive rather than substantive. The same may be said of Hull's “First Coal.” The general application of “foot” to the two seams immediately below and above the Gannister Mine, preclude the use of Binney's term. “First Coal” is appropriate, if it were always understood that coal seams should be enumerated from below upwards; but this is not the case, for Hull himself, in his “Geology of the Country around Wigan,” p. 9, 1862, *Geol. Survey Memoir*, described the Upper Mountain Mine of Billinge as “1st Coal,” and counted down from it. We venture to retain the the term of “First Coal” however since it has not been used hitherto as a substantive.

The “First Coal” is remarkably constant, having been noted at places so far apart as Chorley and Stalybridge, Bury and Cliviger. Its uniform occurrence has been noted by Binney, Dickinson, Hull, and Wild.

The seam is unimportant economically, since it rarely exceeds ten inches.

The seam is six inches thick at Stalybridge, and runs up to ten inches as it approaches the western side of the coal-field, whilst to the north at Cliviger it thins away to four inches.

It is not very clear what seam is represented by the Lower Early Banks Mine. The Sandrock or Feather Edge Coal and the overlying Rough Rock are said to be absent at Stalybridge. If this be the case, then the Lower Early Banks Mine must represent one of the seams under the Gannister coal. It would seem at first sight doubtful that it is the First Coal of Prof. Hull, had he not drawn attention to the character of the latter seam at Binns, east of Tunshill. "Here, indeed," says Prof. Hull, "there appear to be two thin seams, which basset on the banks of the new reservoir, the upper 18 inches, the lower 6 inches in thickness." (*Op. cit.*, p. 17.)

A comparison of Mr. Wild's sections of the Lower Coal Measures at Stalybridge and Hough Hill with those of other districts shows that sedimentation was not so pronounced on the east of the coalfield as elsewhere, the shales and sandstones being thinner. According also to Prof. Hull (*op. cit.* p. 16), the Lower Foot Coal is often absent, so that the Lower Early Banks Mine must be either the First Coal, or the Bassy Mine, or the two united. The indication of the two seams at Binns points to the last conclusion as very probable, and this view I am inclined to accept.

The value of the First Coal as a datum line has not yet been realised, but if it can be shown, as appears likely, that it is in evidence where the Upper Rough Rock is absent, and also constant over the latter, then of the two it will be most useful and reliable.

BASSEY MINE. Binney.

1841.—“*Coal (Bassey)*, never worked in the neighbourhood of Bury. Two feet, three inches thick. The chief mine of New Mills, Mellor, Compstall, and Ludworth.” Binney, *Trans. Manch. Geol. Soc.*, vol. i., p. 77.

1860.—“*A sixteen-inch coal* at Whaley Bridge and Ludworth. “Appears to be identical with the Salts Mine of Bury.” Binney, *op. cit.*, vol. ii. p. 81.

1860.—“*The New Mills Seam*, called by Mr. Hall the “Salts Coal,” from its fracturing like Epsom Salts.” Binney, *op. cit.*, p. 87.

1860.—“*The Salts Mine* occurs on the south side of Birtle Valley, near Middleton. Binney, *op. cit.*, p. 88.

1862.—Occurrence of the Salts Mine in Dulesgate, between the foot coal and the Spanish juice seams. Binney, *op. cit.*, vol. iii., p. 327.

1862.—“*The coal* described by Prof. Hull as *nine inch in thickness*, and visible at Tottington, probably represents the Bassy Mine, the next coal above it being the Lower Foot Mine. Hull, *Geol. Surv. Memoirs*, “Geology of the Country around Bolton-le-Moors,” p. 5.

1862.—“*Lower Mountain Mine* (6th coal) of Hull’s section of the Gannister Beds at Billinge. Hull, *op. cit.*, “Geology of the Country around Wigan,” p. 10.

1864.—“*Second Coal or Lower Yard Mine* in general section of the Oldham district. Hull, *op. cit.*, “Geology of the Country around Oldham,” pp. 16 and 18.

1866-7.—The “*Ribbon*” *Coal* of Disley apparently occupies the position of the Salts Mine. *Vide* Binney, *Trans. Manch. Geol. Soc.*, vol., vi., p. 104.

1875.—“At Long Clough there is a *coal seam* only a few feet above the Rough Rock, and therefore near the base of the Coal Measurers. It lies about 55 yards below the Gannister Coal, which crops out on the bank above the brook. The coal is about 18 inches thick and of inferior quality. It is probably the seam known in some places as the ‘*Lower Yard Mine*,’ and called by Mr. Binney in his tabular view of the coals of Lancashire ‘the Bassy Coal.’” Hull, *Geol. Survey Memoir*, “Geology of the Burnley Coalfield,” p. 60.

1886-7-8.—“*Lower Yard Mine* of Wicken Hall Clough, Saddleworth. W. Watts, *Trans. Manch. Geol. Soc.*, vol. xix., p. 53.

1886-7-8.—“*Coal or Bassy Mine* (Lower Yard Mine of Saddleworth.) Two feet thick in Rossendale. C. Dugdale, *op. cit.*, pp. 220, 226.

1890-1-2.—*Lower or Dirty Yard Coal*, and *Yard Mine*. Wild, *op. cit.*, vol. xxi., p. 375.

1892-3-4.—“*Shale Bed*” seam of the Rishton Colliery, near Blackburn. “I consider this ‘Shale Bed’ is the ‘Salts’ or ‘Bassy Mine’ of Mr. Binney’s section.” P. W. Pickup, *op. cit.*, vol. xxii., p. 237.

This seam is remarkable in many respects; it ranges over the whole coalfield, and was, I believe, recognised by Binney in Staffordshire. Throughout the coalfield its thickness is usually about three feet, and in nearly all cases the coal is of inferior quality and passing into shale. The sectional block of this seam, presented to the Manchester Museum by Mr. William Pickup, of Rishton, is an excellent example of its usual character. A portion of the coal, usually the lowest part of the seam, is fairly good, but it passes upwards into a curious alternation of coal and shale bands, until the latter predominates to the complete exclusion of the coal. The term, “Shale Bed Seam,” of Mr. Pickup is a very apt and descriptive one.

Although several names have been given to the seam, but three are in general use, and need to be considered as worthy of retention. The term “Bassy Mine,” which is perhaps in most use, was probably never intended by its author as a name at all.

The first mention of the seam which I have found is that by Binney, *Trans. Manch. Geol. Soc.*, vol. i., 1841. It is here described as “Coal (Bassy);” the inclusion of the word “Bassy” in brackets plainly shows that it was intended as descriptive merely of the inferior quality of the coal. Another proof of this is the constant use of Mr. John Hall’s name of “Salts Mine” by Binney (*op. cit.*) when describing either the coal or its occurrence. “Salts Mine” certainly has priority, but the difficulty of securing its adoption in place of “Bassy Mine” is too great to be easily got over. During the last ten years the term “Lower Yard

Mine," formerly restricted to the Saddleworth district, has often been used, but its adoption cannot be supported or recommended for reasons which I have already dealt with. I am of opinion that where possible the seam ought to be designated as the "Salts Mine" of Hall, and failing that, as the "Bassy or Salts Mine."

The term "Salts Mine" was given by Hall, according to Binney, because of a similarity of fracture of the coal to that of Epsom Salts.

(LOWER) FOOT MINE. Binney.

1841.—*Coal (Foot Mine)*, Principal mine of Quarlton and Affeside. Binney, *Trans. Manch. Geol. Soc.*, vol. i., p. 77.

1860.—Binney, in his second paper on the "Fossil Shells of the Lower Coal Measures," expresses a doubt whether the Bullion Coal of Burnley was identical with the foot mine of Doghill near Oldham, and that it might eventually prove to be equivalent to the Darwen and Quarlton seam (*i.e.*, the Lower Foot Mine), lying about ten yards below the Gannister Coal. Binney, *Trans. Manch. Geol. Soc.*, vol. ii., p. 82.

1860.—"We saw at Chesham Brook, near Summerseat, the *Quarlton and Darwen Mine* called by Mr. Hall the *Spanish juice Coal*." Binney, *op. cit.*, vol. ii., p. 87.

1860-1-2.—*Spanish juice Seam*, recognised at Dulesgate by Binney, *op. cit.*, vol. iii., p. 327.

1862.—*Lower Foot Mine* at Affeside Colliery, as determined by Mr. Binney. Hull, *Geol. Surv. Mem.*, "Geology of the Country around Bolton-le-Moors," p. 5.

1862.—*Coal (5th Coal)** of Billinge. Hull, *op. cit.*, "Geology of the Country around Wigan," p. 10.

1862-3-4.—*Lower Foot Coal* of Hartshead, Mossley. Dickinson, *Trans. Manch. Geol. Soc.*, vol. iv., p. 160.

1862-3-4.—"*Half Yard Mine*," of Crompton, near Oldham, *op. cit.*, p. 160.

1862-3-4.—*Lower Foot Coal* of Bamford and Ashworth, and of Whitworth and Bacup, *op. cit.*, p. 161.

* The position of this seam under the Gannister Coal agrees with that of the Lower Foot Mine, but is not so stated by Prof. Hull.

1862-3-4.—“*Spanish Juice or Half Yard Mine* at Carr Knol, near Oldham.” Binney, *op. cit.*, p. 230.

1864.—*Lower Foot Mine*, in general section of Lower Coal Measures. Hull, *Geol. Survey Memoir*, “Geology of the Country around Wigan,” pp. 16 and 18.

1866-7.—*Lower Foot Coal* at Oaken Clough, Bacup, and at ending near Rochdale. J. Aitken, *Trans. Manch. Geol. Soc.*, vol. vi. p. 24.

1866-7.—*Stinkard Seam* of Disley. Binney, *Trans. Manch. Geol. Soc.*, vol. vi. p. 104.

1886-7-8.—*Lower Foot Coal* in Rossendale. C. Dugdale, *op. cit.*, vol. xix., pp. 220, 225.

1889-90.—*Lower Foot Coal* at Over Darwen. R. Walkden, *op. cit.*, vol. xx., p. 461.

1890-1-2.—*Lower Foot Coal* at Crompton Moor, near Oldham, and at Colne, Rishton, Bagslate, near Rochdale, and Baxenden. pp. 375, 376.

The oldest term applied to this seam is that of “*Foot Mine*,” given in 1841 by Binney.

Its conversion into *Lower Foot Mine* has probably been the result of the need to distinguish between it and the *Upper Foot* or *Bullion Mine*.

We have already alluded to the name of “*Spanish juice Mine*” given by Elias Hall, so that no further comment is necessary.

The “*5th Coal*” of the Billinge section (Prof. Hull, *Geol. Survey Memoir*, “Geology of Country around Wigan,” p. 10, 1862,) agrees in position with the *Lower Foot Mine*, but this fact is not mentioned by Prof. Hull, nor is the seam correlated. The term “*Half Yard Mine*” has long been in general use in the Oldham district, but its continuance is undesirable.

The “*Stinkard Seam*” of Disley was correlated with the *Lower Foot Mine*, and the former term is therefore a synonym.

The term “*Lower Foot Mine*” is known over the whole coalfield, and no confusion is likely to follow its continued use.

LOWER MOUNTAIN OR GANNISTER MINE.

1836.—*Rabbit or Mountain Mine* of Elias Hall. "Introduction to the Mineral and Geological Map of the Coalfield of Lancashire," by Elias Hall, Manchester, 1836, p. 8.

1836.—*Mountain Mine of Looney*, in "List of Organic Remains, &c., and where found, to accompany Elias Hall's *Introduction and Map*," p. 26.

NOTE.—The "List" is incorporated with the Introduction, the pagination being continuous.

1841.—*Gannister Coal*, often called the "*Rabbit*" or "*Mountain*" Mine. Binney, *Trans. Manch. Geol. Soc.*, vol. i., p. 77.

1841.—*Mountain Mine* of Looney identified with *Gannister Coal*, *op. cit.*, p. 84.

1841.—"*The Rochdale or Gannister Coal* lying at Birtle Dean." Binney, *Trans. Manch. Geol. Soc.*, vol. i., p. 87.

1860.—(Non) *Gannister Coal* of Dulesgate. NOTE.—Correlated by Binney with the coal at Mr. Dearden's Colliery in Dulesgate, the latter is however the Mountain Four Feet. Binney, *Trans. Manch. Geol. Soc.*, vol. ii., p. 81.

1860.—*Gannister Coal* of Birtle Colliery and Birtle Valley, near Brooksbottom, *op. cit.*, p. 88.

1860-1-2.—*Lower Mountain Mine* of Dunkenhalth Park, near Church. Mr. Farrimond, *op. cit.*, vol. iii., p. 32.

1862.—*Mountain Mine* of the Bolton District. *Vide* Hull, *Geol. Survey Memoir*, "Geology of the Country around Bolton-le-Moors," p. 5.

1862.—*Mountain Mine represented by two seams* at Doffcocker Colliery, near Bolton. *Op. cit.*, p. 6.

1862.—*Gannister Coal (4th Coal)* of Billinge. Hull, *Geol. Survey Memoir*, "Geology of the Country around Wigan," p. 10.

1862-3-4.—"*Gannister*," a term applied by Dickinson to the Lower Mountain Mine, *op. cit.*, vol. iv., p. 159.

1862-3-4.—*Mountain, or Three-quarter Mine* of Hartshead, Mossley, *op. cit.*, p. 160.

1862-3-4.—*Mountain Mine* of Crompton, Bamford, and Ashworth, near Oldham, *op. cit.*, p. 161.

1862-3-4.—*Yard or Main Coal* of Bacup. Dickinson, *Trans. Manch. Geol. Soc.*, vol. iv. p. 161.

1862-3-4.—*Lower, Seventy Yards, or Half Yard Bed* of Over Darwen. *Op. cit.*, p. 162.

1862-3-4.—*Gannister Coal* at Dunkenhalth Colliery. *Op. cit.*, p. 166.

1862-3-4.—“*The Mountain or Gannister Coal* of Oldham is the *Main bed* of Bacup.” Dickinson, *op. cit.*, p. 194. Discussion on Mr. G. Wild’s paper: “On the Fulleage section of the Burnley Coalfield.”

1864.—*Gannister Coal or Mountain Mine*, in general section of the Lower Coal Measures of the Oldham district. Hull, *Geol. Survey Memoir*, “Geology of the Country around Oldham,” p. 16.

1864.—Range of *Gannister or Mountain Mine*. *Op. cit.*, p. 18.

1866-7.—*Sweet Seam* of Bowstones, near Disley, correlated with a seam (*Gannister*) at Burnley, which unites at the latter place with the Upper Foot Mine above it, *Trans. Manch. Geol. Soc.*, vol. vi. p. 104.

1864-66.—“*The Gannister or Mountain Mine* is generally known in the neighbourhood of Bacup as the *Yard Mine*.” J. Aitken, *Trans. Manch. Geol. Soc.*, vol. v., p. 186.

1875.—(Non.) *Gannister Coal or Mountain Mine* in general section of the Lower Coal Measures, Cliviger. Hull, *Geol. Survey Memoir*, “Geology of the Burnley Coalfield,” p. 55.

NOTE.—(The so-called *Gannister Coal* of Cliviger, and the whole of the Burnley district is the *Mountain Four Feet*, *i.e.*, the *Gannister* and *Bullion Coal* seams united.)

1875.—(In part) *Gannister Coal or Mountain Mine* of Prof. Hull. *Mem. Geol. Survey*, “Geology of the Burnley Coalfield,” p. 56.

1875.—*Gannister Coal or Half-Yard Mine* of the Darwen district. *Op. cit.*, p. 57.

1875.—*Lower Mountain Mine* of Shackleton Holmes, and Hogshead Colliery, Lower Mine of Oaken Clough. *Op. cit.*, p. 60.

1875.—Range through the Bacup district. *Op. cit.*, p. 61.

1875.—*Yard Coal of Bacup*. J. Aitken, quoted by Hull, *op. cit.*, p. 62.

1875.—(Non) *Gannister Coal* of Dulesgate and Green’s Clough. Hull, *Geol. Survey Memoir*, “Geology of the Burnley Coalfield,” p. 62.

1875.—*Lower Mountain Mine*, or *Gannister Coal* of the Accrington and Blackburn districts. *Op. cit.*, p. 64.

1875.—*Third Coal* of Cherry Tree Works and Mill Hill, near Blackburn. *Op. cit.*, p. 64.

1875.—(Non) *Gannister Seam* of two borings at Northwood Farm, Padiham Heights. *Op. cit.*, p. 67.

1875.—(Non) *Gannister Coal* of Swinden Hall and Caster Cliff Hill. *Op. cit.*, p. 67.

1875.—*Lower Mountain Mine* of Chorley district, and of Charnock Richard and Charnock Green. . . Hull, *Geol. Survey Memoir*, "Geology of the Burnley Coalfield," p. 91.

1889-90.—"*Lower Mountain Mine*." "*Seventy Yards Mine*," and "*Half-Yard Mine*" of Cranberry Lane Colliery, Over Darwen. R. Walkden, *Trans. Manch. Geol. Soc.*, vol. xx., p. 461.

1890-1-2.—*Higher Early Banks Mine* of Stalybridge or Hough Hill. Wild, *op. cit.*, vol. xxi. plate opposite page 394.

1890-1-2.—*Gannister Mine* of Meadows Pit, Bacup, erroneously correlated with the "*Halifax Hard Bed*." R. Kidston, *op. cit.*, p. 416.

This, the chief coal seam of the Lower Coal Measures, has naturally received the greatest amount of attention, and still has a varied nomenclature.

Of all the terms which have been or are in use, the two we use are of especial value, and both are very old. The term "*Rabbit*" or "*Mountain Mine*" seems to have been first used in literature for this mine by Elias Hall and Francis Looney. The name, however, is not theirs, but was quoted as one in general use. Its origin is probably to be sought for in the circumstances of hamlet life which we touched upon in the opening part of this paper.

The term "*Gannister*" was known to Prof. Phillips, but it does not seem to be known if coined by him. Binney quoted Prof. Phillips in 1841, *op. cit.*, the quotation showing that the term was by Phillips restricted to the hard siliceous rock underlying the coal seam, a fact emphasised by Prof. Hull in 1862,—(*Geol. Survey Memoir, Geol. Wigan*, p. 9)—who also states (*Geol. Oldham*, p. 18)—that he found the term in general use in 1864 amongst the colliers from Stalybridge southwards.

The term "*Mountain Mine*" was used somewhat loosely so long ago as 1837, for in that year, as we shall see later, it

was applied by Prof. Williamson to the Bullion Mine. It is scarcely likely that at this time the coal seams were well understood, or their geographical range known, and I am inclined to believe at the very outset the term was a general one, and applied to all workable seams in the hilly districts of Lancashire. As in a case we have already cited, Lower Foot Coal, the term was qualified later by the addition of "Lower," and "Lower Mountain Mine" came into use as distinguished from the "Upper Mountain Mine," applied to a higher seam. With "Gannister" the case is somewhat different, first applied to distinguish a rock, its application spread to the coal seam, and afterwards to the whole series. It is still used in all three ways, and we are in order if we speak of a "Gannister Rock," or the "Gannister Mine," or even the "Gannister Series," meaning the whole Lower Coal Measures. Its extension to the whole series is most likely due to the fact pointed out long ago by Dickinson—(*Trans. Manch. Geol. Soc.*, vol. iv., p. 161, 1862-3-4)—and others, that a Gannister rock was not peculiar to the seat of the Gannister Mine, but occurred elsewhere higher in the series. The term was applied to the rock very properly irrespective of its position, and since Gannister rock was found both low and high in the Lower Coal Measures, and was absent in the strata above and below, it easily became a distinguishing feature of the series. Some of the terms once in use illustrate the insularity of miners and others, in days when travelling was less general and easy than now, by reason of their strictly local character. Such terms as "Main Coal" and "Sweet Seam" are examples.

Not a little confusion has arisen in respect to the Gannister Mine by reason of its junction with the Upper Foot or Bullion Mine. This union of two seams we shall consider later, but must here draw attention to the fact that at various times the seam of coal formed by the union has

been regarded sometimes as the Gannister, and sometimes as the Bullion, most rare of all has it been indicated as a union of the two.

For this reason we may, without exception, when meeting with the terms Gannister Mine, or Bullion Mine, in papers dealing exclusively with the Burnley Coalfield read Mountain Four Feet instead, for over the whole of this coalfield the seams are united. A singular and confusing discrepancy regarding the Gannister Mine exists in Elias Hall's "Introduction to the Mineral and Geological Map." On page 8, Hall describes the Gannister Rock, and says that it is "well known to be the floor of a good two-feet coal, called the Rabbit or Mountain Mine." Proceeding further, the Gorse Hall Rock is mentioned, and it is said that "at Little End, in Strines Dale, near Oldham, two seams of coal are found *above* this rock; one is one foot, and the other two feet seven inches thick."

Looney, in the same work, page 26, writes as follows: "Under this rock there is a small one-foot coal, and *under* it a small two-feet, known by the name of Mountain Mine."

The difficulty of determining which statement is correct, and what seams are meant, would be considerable had not Looney expressly stated that the two-feet coal was lowest. The three seams lying below the Gorse Hall Rock are in descending order, the 40 Yards, Upper Foot, and Gannister Mines.

The only two of these which agree with Looney's description are the Upper Foot and the Gannister, the latter, as we have already seen, being then known as the Mountain Mine.

The statement made by Hall of these seams occurring over the Gorse Hall Rock at Strines Dale was probably one of those mistakes which happen occasionally to all careful writers. At Strines Dale, as I learn by enquiry to Mr. George Wild, a colliery once existed in which the Gannister was worked.

At Sunfield, a little beyond Strines Dale, Mr. Wild tells me that a quarry once existed, yielding flags and paving stones. The Upper Foot or Bullion coal lies below the rock, which may therefore be the Gorse Hall Rock of Hall.

The Gannister seam has a wide range, being found along the whole fringe of Lower Coal Measures which border the margin of the middle series in the west, north, and east of the coalfield. Its quality is usually good, and the thickness fairly constant, averaging about two feet six inches. As the seam lies almost invariably near the surface it has been mined extensively, especially in the north of the coalfield, where great numbers of ruined and abandoned adits occur on the hillsides.

UPPER FOOT OR BULLION MINE.

1836.—*Foot Coal* of Elias Hall, erroneously said to occur above the Gorse Hall Rock. E. Hall, "Introduction to the Mineral and Geological Map of the Coalfield of Lancashire," Manchester, 1836, p. 8.

1836.—*Foot Coal* of Looney, in "*List of Organic Remains, &c., and where found,*" to accompany Mr. Elias Hall's *Introduction and Map*, p. 26.

1837.—*Mountain Mine*, W. C. Williamson, *British Assoc. Report*, Liverpool, p. 82.

1841.—*Eight inch coal* in general section of the Lancashire Coal Measures. Binney, *Trans. Manch. Geol. Soc.*, vol. i. p. 76.

1841.—Coal seam "worked at Yeadon, Rawdon, and Honsforth, near Leeds; at Baildon and Heaton, near Bradford; at Catherine Stack and Swan Banks, near Halifax; at Bull Houses, near Penistone; and at several points west of Sheffield." Prof. Phillips in *Encyclopedia Metropolitana*, p. 570, quoted by Binney, *Trans. Manch. Geol. Soc.*, vol. i., p. 81.

1860.—*Op. cit.*, vol. ii., p. 74.

1860.—*Pecten Coal* of Phillips, *op. cit.*, vol. i., p. 82; *op. cit.*, vol. ii., p. 75, 1860.

1860.—*Halifax Coal*, Mr. Teale, "On the Fossil Ichthyology of the Yorkshire Coalfield," *Geological and Polytechnical Soc. of the West Riding of Yorks.*, December 5th, 1839. Quoted by Binney, *op. cit.*, p. 83, and *op. cit.*, vol. ii., p. 76.

1860.—*Foot Coal* of Looney, erroneously correlated with the Forty Yards Mine of Burnley and Rochdale by Binney, *op. cit.*, p. 84.

1860.—*The Foot Coal of Looney* is here correlated with the Foot Coal of Doghill, near Oldham, and of Pimbo Lane. Binney, *Trans. Manch. Geol. Soc.*, vol. ii. p., 77. Revised reprint of the paper published in vol. i.

NOTE.—Mr. Binney for some unexplained reason repeated before the Manchester Geological Society in 1860 the leading details of a paper he had communicated to the same Society in 1840. The correlation of the coal seams is a little different, otherwise the papers are identical. The papers are "Remarks on the Marine Shells found in the Lancashire Coalfield," *Trans. Manch. Geol. Soc.*, vol. i., p. 80; and "Observations on the Fossil Shells of the Lower Coal Measures." *Op. cit.*, vol. ii., p. 72.

1860 —*Foot Coal* of Doghill, near Oldham, and the railway cutting near Pimbo Lane Station, Upholland. *Trans. Manch. Geol. Soc.*, vol. ii., p. 77.

1860.—*Foot Mine* of Chesham Brook, near Summerseat. Binney, *op. cit.*, p. 87.

1860.—(Non) *Bullion Coal* of Burnley. Binney, *op. cit.*, p. 82.

1862.—*Upper Foot Mine* seen at Lomax Wood Mill, Bury. Hull, *Geol. Survey Memoir*, "Geology of the Country around Bolton-le-Moors," p. 6.

1862.—*Bullion Coal (3rd Coal)* in "General Section through the Gannister Beds, Billinge." Hull, *Geol. Survey Memoir*, "Geology of the Country around Wigan," p. 10.

1862.—"*Hard Bed*" seam of Halifax, correlated by Binney with the Bullion Mine of the Burnley district and the Gannister Mine of Dulesgate, Todmorden. *Trans. Manch. Geol. Soc.*, vol. iv., p. 18.

NOTE.—The Bullion Mine of Burnley and the Gannister of Dulesgate form part of the Mountain Four Feet, *i.e.*, the Gannister and Bullion united, but since Mr. Binney was well aware of this fact, we are justified in assuming that he was correlating the "Halifax Hard Bed" with the upper portion of the two seams mentioned; a conclusion which was quite correct. His correlation was based upon the presence of similar "baum-pots" in the *roof* of each seam.

1862-3-4.—*Upper Foot Coal*, in "General Section of the Lower Coal Measures at Hartshead, near Mossley." Dickinson, *op. cit.*, p. 160.

1862-3-4.—*Upper Foot Coal* of Crompton, near Oldham; of Bamford and Ashworth; of Birchinley, Dearnley, and Clegg's Wood, near Rochdale, and of the Wardle and Whitworth valleys to Bacup. Dickinson, *Trans. Manch. Geol. Soc.*, vol. iv., p. 161.

1862-3-4.—(Part) *Bullion Coal* of Towneley Colliery, Burnley. G. Wild, *Trans. Manch. Geol. Soc.*, vol. iv., p. 189.

1862-3-4.—(Part) *Bullion Coal* of Spa, Clough, Burnt Hills, Doddbottom, Townhouse, and Carre Heys. *Op. cit.*, p. 189.

1862-3-4.—(Non) *Bullion or Mountain Four Feet* of Burnley. *Op. cit.*, p. 193.

1862-3-4.—*Upper Foot Mine* of Oldham. *Op. cit.*, p. 194

1862-3-4.—(Part) *Holmes Chapel Mine*. *Op. cit.*, p. 194.

1862-3-4.—*Upper Foot Coal* of Wholau Nook. *Op. cit.*, p. 194.

1864.—*Upper Foot or Bullion Mine*, in "General Section of Lower Coal Measures." Hull, *Geol. Survey Memoir*, "Geology of the Country around Oldham," p. 16.

1864.—*Upper Foot or Bullion Mine*, in section at Broadoak Mill, Bury. *Op. cit.*, p. 16. The seam is said to thin out at Broadbottom. *Op. cit.*, p. 19. At Helpet Edge, Besom Hill, and Stalybridge. *Op. cit.*, p. 19.

1864-66.—*Higher Foot or Bullion Mine* and union with Gannister at Bacup. J. Aitken, *Trans. Manch. Geol. Soc.*, vol. v., p. 186.

1864-66.—*Foot Coal* at Oldham. Binney, *op. cit.*, p. 190.

1866-7.—*Higher Foot or "Spanish Juice Mine."* Aitken, *op. cit.*, vol. vi., p. 26.

1866-7.—*Lower Smut Coal* of Bakstondale and Shrigley Brook, Disley. Stated to be equivalent to the Upper Fort, of Oldham, and other places. Binney, *op. cit.* pp. 103, 104.

1866-7.—*Little Smut Coal* of general section of Coal Measures of the Disley district. Binney, *op. cit.*, p. 105.

1874-5.—*Upper Foot Coal* of Oldham. Aitken, *op. cit.*, vol. xiii., p. 201.

1875.—*Upper Foot Mine* of Littleborough, Wardle and Bacup districts. Hull, *Geol. Surv. Memoir*, "Geology of the Burnley Coalfield," pp. 59, 60, 61.

1875.—*Second Coal* at Cherry Tree Works, Blackburn. *Op. cit.*, p. 64.

1886-7-8.—*Upper Foot Coal* at Rossendale. C. Dugdale, *Trans. Manch. Geol. Soc.*, vol. xix., pp. 220, 224.

1888-9-90.—*Upper Foot* or *Bullion Mine* of Rossendale. Bolton, *Trans. Manch. Geol. Soc.*, vol. xx. p. 215.

1890-1-2.—*Foot Mine* or *Upper Foot* of the Blackburn and Accrington district. *Foot Mine* above the Gannister Bed, in the districts of Rochdale, Crompton, Oldham and Hartshead, Ashton-under-Lyne. *Op. cit.*, vol. xxi. p. 367.

1890-1-2.—Absent at Rishton, near Blackburn. *Op. cit.*, p. 367.

1890-1-2.—*Bullion Coal* or *Foot Mine*, of Hough Hill, Stalybridge. *Op. cit.*, p. 368.

1890-1-2.—*Upper Foot* or *Bullion Coal*. *Op. cit.*, p. 376.

1890-1-2.—*Little Coal* of the Darwen district. Mr. W. Taylor in discussion on Mr. Wild's paper. *Op. cit.*, p. 399. Compare with Dickinson, vol. iv., p. 163.

The wonderful preservation of plant tissues in the "Bullion" balls which lie in the roof of this seam, and also the rich fossiliferous character of the roof shales, have resulted in considerable attention being given to the mine wherever it has been known to occur.

This seam is undoubtedly the "Foot Coal" of Hall and Looney, and the "Mountain Mine" of Professor Williamson. The earliest use of the term "Upper Foot" that I know of is by Prof. Hull in 1862, but he probably found it already in use. The "Bullion Coal" is an older term and was used by Binney in 1860. It is now in general use.

It is not quite clear what name the Bullion seam goes under in the Darwen district, the correlation of the Lower Coal Measure seams there being a difficult matter.

Mr. Dickinson omits all mention of it from his remarks upon the Darwen district in his paper "On the Coal Strata of Lancashire."

In the discussion upon a paper by Mr. Wild ("The Lower Coal Measures of Lancashire," *Trans. Manch. Geol. Soc.*, vol. xxi., p. 399, 1890-1-2), Mr. William Taylor claimed to

have an intimate knowledge of the Bullion Coal in the Darwen district, where he said it was best known as the "Little Coal." He would seem, however, to place the Bullion Coal above the Upper Mountain Mine, though this even is not clear, and in fairness we repeat the printed statement: "There is a fault which runs nearly parallel with the old Roman road from Entwistle, through Blacksnape, nearly to Blackburn. On the west side of this road the Bullion Coal is usually found nine yards above the Upper Mountain Mine." It may be that what is meant is that the Bullion Coal is usually found nine yards above the Upper Mountain Mine, but on the *opposite* side of the fault.

I do not feel justified, however, in reading such a meaning into it, but from a study of the literature alone I am strongly inclined to infer that the 40 Yards or Upper Mountain Mine is not a double seam, but that the lower of the two is the true Bullion Mine, which is approaching the 40 Yards, in a similar way to the approach of the Gannister to the Bullion.

MOUNTAIN FOUR FEET MINE.

1841.—*Gannister Coal* of Burnley and Dulesgate in general section of Lancashire and Cheshire Coalfield. Binney, *Trans. Manch. Geol. Soc.*, vol. i., p. 77.

1841.—*Rochdale or Gannister Coal* of Dearden's Colliery in Dulesgate, *op. cit.*, pp. 87, 88.

1860.—"*Rearing Mine* on the west side of the Burnley basin," and *Bullion Mine* on the east side. *Trans. Manch. Geol. Soc.*, vol. ii., p. 76.

1860.—*Gannister Coal* of Dulesgate, recognised as formed by the union of the Foot and Gannister seams, *op. cit.*, vol. ii., p. 81, also

1860-1-2.—Vol. iii., p. 327.

1860.—*Bullion Coal* of Holme, Spa Clough, Cloughhead, Carre Heys, and other localities near Burnley, supposed by Mr. Dickinson to consist of the Gannister and Foot Coals united, *op. cit.*, vol. ii., p. 81.

1862-3-4.—Reference to the *Bullion Mine* of the Burnley district and the *Gannister Mine* of Dulesgate, Todmorden. Binney, *Trans. Manch. Geol. Soc.*, vol. iv., p. 18.

1862-3-4.—“*Mountain Four Feet* of Cliviger and all round the northern part (of the coalfield) to Colne.” Dickinson, *Trans. Manch. Geol. Soc.*, vol. iv., p. 162.

1862-3-4.—*The Gannister Coal* of four feet thickness at Bacup. Dickinson, *op. cit.*, p. 162.

1862-3-4.—*Bullion Coal* of Burnley, Spa Clough, Burnt Hills, Doddbottom, Townhouse, and Carre Heys. Wild, *op. cit.*, p. 189.

1862-3-4.—*Bullion Coal* of Burnley, supposed to be the equivalent of the Upper Foot and Gannister Coals of Crompton and Oldham. Wild, *op. cit.*, p. 193.

1862-3-4.—*Holmes Chapel Mine*. Wild, *Trans. Manch. Geol. Soc.*, vol. iv., p. 194.

1862-3-4.—*Bullion or Mountain Four Feet* identical with the Main Coal of Bacup. Wild quoted by Dickinson, *op. cit.*, p. 193.

1864-66.—*Five Feet Mine* of Bacup. Aitken, *op. cit.*, vol. v., p. 186.

1866-7.—*Five Feet Mine*, two mile East of Bacup. Aitken, *op. cit.*, vol. vi., p. 25.

1866-7.—*Bullion Mine* of Burnley. Binney, *op. cit.*, p. 65.

1875.—*Gannister Coal or Mountain Mine* in the general section of the Lower Coal Measures, Cliviger. Hull, *Geol. Survey Memoir*, “Geology of the Country around Burnley,” p. 55.

1875.—Due to union of Gannister and Upper Foot Mine. *Op. cit.*, p. 61.

1875.—In Dulesgate and the Portsmouth Valley. *Op. cit.*, p. 62.

1875.—*Gannister Coal* of Fulledege, Burnley. *Op. cit.*, p. 64.

1875.—*Gannister Seam* in sections of borings at Northwood Farm, Padiham Heights. *Op. cit.*, p. 67.

1875.—*Gannister Seam* of the Colne district. *Op. cit.*, pp. 67, 68.

1886-7-8.—Occurrence at Gorpley Clough and one and a half miles east of Bacup. *Trans. Manch. Geol. Soc.*, vol. xix., p. 225.

1888-9-90.—*Upper Foot Coal* in the Hapton Valley. Wild, *op. cit.*, vol. xx., p. 223.

1890-1-2.—*Mountain Four Feet or Bullion Coal.* Wild, *Trans. Manch. Geol. Soc.*, vol. xxi., p. 366.

1890-1-2.—*Upper Foot or Bullion Coal* of Dulesgate, Burnley and Colne districts. *Op. cit.*, p. 370, and p. 376.

This seam formed by the union of the Gannister and Bullion Mine, along an irregular north-north-west and south-south-east line, a little south of Burnley, stretches under the whole of the Burnley Coalfield, reaching the surface in the Padiham, Colne, and Portsmouth valley districts. The coal is not so good as that of the two seams before they join, but is much thicker, the seam varying from four to five or six feet. Messrs. Binney, Dickinson, and Wild very early recognised that a junction of the two seams was the most likely explanation of the great thickness of what was regarded as the Bullion Coal of the Burnley district, but the actual demonstration of the line of junction was made by Aitken in 1867, from observations in the colliery at Sharneyford, near Bacup, where the Mountain Four Feet had been worked backwards into the Gannister seam, the Upper Foot or Bullion Mine being lost in the roof. Throughout the Burnley district the seam has been known chiefly as the Bullion Coal, but sometimes as the Gannister. Binney also speaks of it as the "Rearing Mine" of the west side of Burnley, but this was a general rather than a specific term.

THIN COAL ABOVE BULLION MINE.

1841.—*Eight Inch Coal* in section of Lower Coal Measures. Binney, *Trans. Manch. Geol. Soc.*, vol. i., p. 76.

1860-1-2.—*A small seam of a few inches thick*, 10 yards above the Gannister (Mountain Four Feet) in Dulesgate. Binney, *op. cit.*, vol. iii., p. 327.

1862.—*Fire-clay Coal* of Upholland (2nd Coal), ten inches thick. Hull, *Geol. Survey Memoir*, "Geology of the Country around Wigan," p. 9.

1866-7.—*A thin band of coal about one inch thick, occurring in Hoyle Hey clough, Bacup, and very constant over an area of many square miles.* Aitken, *op. cit.*, vol. vi., p. 26.

1862-3-4.—*Middle Mountain Mine of Upholland, correlated by Dickinson with the 40 Yards Mine.* *Trans. Manch. Geol. Soc.*, vol. iv., p. 163.

1875.—*Two Inch Coal* in general section of the Lower Coal Measures, Cliviger. Hull, *Geol. Survey Memoir*, "Geology of the Burnley Coalfield," p. 55.

This seam is, notwithstanding its extreme tenuity, very persistent in the Burnley and Rossendale districts. It does not seem to have been recognised elsewhere, with the exception of Upholland, in the Wigan district, where a ten-inch coal, called by Prof. Hull, the "Fireclay Coal" occupies the same position between the Bullion and Upper Mountain Mines. Whether the Fireclay coal is a continuation of the Thin Coal of the Burnley Coalfield or not, the occurrence of a coal seam between the Bullion and Upper Mountain Mines on two sides of the Darwen district, lends additional interest to a right interpretation of what mines are really present there, and what is their true correlation. This question dealt with a little already, we shall have again to consider when discussing the thin coals above the Upper Mountain Mine.

40 YARDS OR UPPER MOUNTAIN MINE.

1841.—*Coal (Pyritous)* in general section of the Lancashire and Cheshire Coalfield. Binney, *Trans. Manch. Geol. Soc.*, vol. i., p. 76.

1841.—(Non) *Foot Coal* of Looney, as concluded by Mr. Binney, *op. cit.*, p. 84.

NOTE.—Corrected in vol. ii., p. 77.

1841.—*40 Yards Coal* of Rochdale. *Op. cit.*, p. 88.

1841.—*Coal at Dulesgate*, 73 yards above the Gannister Coal. Binney, *op. cit.*, p. 88.

1860.—*Op. cit.*, vol. ii. p. 82.

1860.—*Parron Mine* of Stalybridge. Binney, *op. cit.*, p. 88.

1860.—*40 Yards Coal* of Chesham Brook, near Summerseat. Binney, *op. cit.*, p. 87.

1860-1-2.—*40 Yards Coal* of Dulesgate, Todmorden. Binney, *op. cit.*, vol. iii., p. 327.

1862.—*40 Yards Mine* of the Bolton district. Hull, *Geol. Survey Memoir*, "Geology of the Country around Bolton-le-Moors," p. 6.

1862.—*Upper Mountain Mine (1st Coal)*, of Hull, *Geol. Survey Memoir*, "Geology of the Country around Wigan," p. 9.

1862-3-4.—*40 Yards Coal* of Bamford, Ashworth, Crompton, Oldham, and of Hartshead Colliery, near Mossley. Dickinson, *Trans. Manch. Geol. Soc.*, vol. iv., pp. 160, 161.

1862-3-4.—*Little, Top, or Half-yard Mine* of Bacup. Dickinson, *op. cit.*, p. 161.

1862-3-4.—*Top Bed Coal*. So termed in the Burnley area. *Vide* Dickinson, *op. cit.*, p. 162.

1862-3-4.—In two seams (*Cannel* and *Black Mines*) at Towneley Colliery. *Op. cit.*, pp. 162, 163.

1862-3-4.—*Yard Coal* and *Little Coal* of Over Darwen corresponds with the 40 Yards Seam. *Op. cit.*, p. 163.

1862-3-4.—*Yard and Little Coals* of the old Hoddlesden Colliery. Dickinson, *Trans. Manch. Geol. Soc.*, vol. iv., p. 163.

1862-3-4.—Divides into a lower *Little Coal* and an upper *Half-yard* seam at Belthorn. *Op. cit.*, p. 163.

1862-3-4.—*Poor Robin Bed* of Brookside and Duckworth Hall. *Op. cit.*, p. 163.

1862-3-4.—*Little and Higher Mountain Seams* of Chorley and Heath Charnock. *Op. cit.*, p. 163.

1862-3-4.—(Non) *Middle Mountain Mine* of Upholland and Bispham. *Op. cit.*, p. 163.

1862-3-4.—*Upper Mountain Mine* of Upholland. *Op. cit.*

1862-3-4.—*Higher Mountain Mine* of Duxbury. *Op. cit.*, p. 164.

1862-3-4.—*Top Bed Coal* of Townhouse Colliery, Marsden. Wild, *Op. cit.*, p. 188.

1862-3-4.—*Spa Clough Top Bed* of Towneley Colliery, Burnley. Wild, *Trans. Manch. Geol. Soc.*, vol. iv., p. 189.

1862-3-4.—*Poor Robin Seam* of Church. Dickinson, *op. cit.*, p. 194.

1864.—*40 Yards Mine* of the Oldham District. Hull. *Geol. Surv. Memoir*, "Geology of the Country around Oldham," pp. 16, 19.

1864-66.—*40 Yards Mine* of Bacup. Aitken, *Trans. Manch. Geol. Soc.*, vol. v., p. 186.

1878.—*Op. cit.*, vol. vi., p. 26.

1864-66.—*Upper Smut Coal* of Disley. Binney, *op. cit.*, p. 103.

1875.—*40 Yards or Upper Mountain Mine* of Darwen and Oswaldtwistle. Hull, *Geol. Survey Memoir*, "Geology of the Burnley Coalfield," p. 56.

1875.—*Yard Seam* of the Darwen district. Hull, *Geol. Surv. Memoir*, "Geology of the Burnley Coalfield," p. 57.

1875.—*Half Yard Mine* of Copy Nook Coal Pit, Spotland. *Op. cit.*, p. 59.

1875.—*Upper Mine* of Hull. *Op. cit.*, p. 59.

1875.—*Upper Mountain Mine* of Dulesgate and Green's Clough. *Op. cit.*, p. 62.

1875.—*Upper Mountain Mine* of the Accrington and Blackburn districts. *Op. cit.*, p. 63.

1875.—*Yard Mine* of Oswaldtwistle. *Op. cit.*, p. 63.

1875.—*First Coal* of Hull, Cherry Tree Works, Blackburn. *Op. cit.*, p. 64.

Second Coal (Upper Mountain Mine) of Clough Head Coal Pit, Marsden. *Op. cit.*, p. 68.

1875.—*Upper Mountain Mine* in Section of the Lower Coal Measures at Charnock Richard, Chorley. Hull, *Geol. Survey Memoir*, "Geology of the Burnley Coalfield," p. 91.

1880-1-2.—*40 Yard Coal* of Binney. *Trans. Manch. Geol. Soc.*, vol. xvi., p. 125.

1886-7-8.—*40 Yards Mine* over Helpet Edge Rock, near New Hey Station. Watts, *op. cit.*, vol. xix., p. 53.

1888-9-90.—*Yard or Mountain Mine* of Over Darwen. R. Walkden, *op. cit.*, vol. xx., p. 461.

1890-1-2.—*Top Bed* in section of strata at Townhouse Colliery, Colne. Wild, *op. cit.*, vol. xxi., p. 391.

1890-1-2.—*40 Yards or Upper Mountain Mine* of General Section. *Op. cit.*, p. 394.

1890-1-2.—*40 Yards Mine* of the Oldham and Rochdale District. G. Wild, *Trans. Manch. Geol. Soc.*, vol. xxi., *op. cit.*, p. 379.

1890-1-2.—*Upper Mountain Mine* of the Burnley and Accrington District. *Op. cit.*, p. 380.

1890-1-2.—*Upper Mountain or Darwen Yard Mine*. W. Taylor, *Trans. Manch. Geol. Soc.*, vol. xxi., p. 399.

The 40 Yards or Upper Mountain Mine may be looked upon as the highest workable seam of the Lower Coal Measures. It was mined in rude fashion, even more extensively than the Gannister seam in the early days of coal mining, and with the exception of small areas where it lies under a covering of Middle Coal Measures, the great bulk of it has been removed.

The origin of the term "40 Yards Mine" we have explained in the introduction to this paper; the alternative term is a modification of the general "Mountain Mine," to distinguish the seam from the Lower Mountain or Gannister Mine.

The nomenclature of this seam offers no features of interest, except in the Darwen district. Here some confusion exists as to the true correlation of the upper seams, and the nomenclature cannot be determined satisfactorily.

Mr. Dickinson, in his paper "On the Coal Strata of Lancashire," *Trans. Manch. Geol. Soc.*, vol. iv., p. 862-3-4, describes the 40 Yards Mine of Darwen as consisting of two seams, a lower "Yard" and an upper "Little Coal."

"At Belthorn, the upper part (seam) is called the "Half-yard," and the lower the "Little Coal."

"At Brookside and Duckworth Hall they again lie together, and are called the "Poor Robin Bed."

"At Chorley, and also at Heath Charnock, the corresponding coals are known as the Little and Higher Mountain."

Prof. Hull ("Geology Burnley Coalfield," *Geol. Survey Memoir*, 1895, p. 57,) put the Yard seam only of the Darwen District as the equivalent of the 40 Yards Mine of elsewhere, and says "at twelve yards above the Yard seam is a little coal of ten inches resting on a true Gannister floor." In all the details he is in agreement with Dickinson.

As we have already seen (p. 58) the "Little Coal" of the Darwen district is also regarded by Mr. William Taylor as the Bullion seam, but whether the upper "Little Coal" or the lower is meant is not clear. To add to this confusion, neither Dickinson nor Hull mention the presence or absence of the Bullion seam, and the thin coal above it in the Darwen area. The Bullion mine is absent at Rishton, three miles to the N.E. of Blackburn, but the fire-clay seating is present, whilst the second coal of Hull, at Cherry Tree Works, Blackburn, seems to correspond to it. ("Geology of the Burnley Coalfield," *Geol. Surv. Memoir*, 1875, p. 64.) These places are but a few miles away from the centre of the Darwen district, and the presence of the Bullion Mine in one, and its fireclay in the other, indicate a likelihood of its occurrence at Darwen. That the Bullion extends far to the south of Darwen we know from its recorded occurrence at Billinge, north of St. Helens. (Hull, *Geol. Survey Memoir*, *Geology of the Country around Wigan*, p. 10, 1862.)

Until the district has been examined afresh and more evidence is forthcoming, the question must be left an open one, and the nomenclature given here accepted with some reservation.

PASTURE, BASSEY, AND OTHER THIN COALS.

Whilst the 40 Yards coal is regarded as the uppermost workable seam of the Lower Coal Measures, it is well known

that several thin seams are to be found in various districts in the shale between the 40 Yards and the Arley Mines.

The first to be described would seem to be the Bassey Mine of Dickinson (non Binney) occurring at Bamford and Ashworth, near Rochdale, and lying 30 yards over the 40 Yards Coal. (Dickinson, *Trans. Manch. Geol. Soc.*, vol. iv., p. 161, 1862-3-4.)

The same author mentions the existence of a thin coal, called the "Horse-pasture seam," at Towneley Colliery, Burnley, some little distance above the divided 40 Yards Mine. (*Op. cit.*, p. 162.)

The "Pastures Mine" of Wild (*Trans. Manch. Geol. Soc.*, vol. xxi., p. 393, 1890-1-2) is a one-inch coal about 77 yards above the 40 Yards Coal, another one-inch coal with a Gannister seat lying between the two and about nine yards under the Pasture Mine.

The Memoirs of the Geological Survey which relate to the Lancashire Coalfield give a number of sections in which thin coals are shown above the 40 Yards Coal; of these the most important would seem to be in Cliviger, where a foot coal occurs 7 yards above the 40 Yards Coal, and 104 yards higher still, and 23 yards below the Arley Mine, is a "Black Clay Coal" in two thin beds.

By bringing together all the references we have been able to obtain, it will be seen that one, two, or even three coals occur either in close relation to the 40 Yards Coal, or at varying distances above it, along a line drawn from Upholland and Bispham on the south-west, to Colne on the north-east, and that similar thin seams can be traced from Littleborough and Wardle on the north, to Oldham on the south.

Taking the whole of the thin coals to which we have found reference, the following only seem to have received distinctive names:—

The "Bin Coal" of Turton Colliery, near Darwen.

The "Horse-pasture Coal" of Towneley Colliery, Burnley.
Pasture Mines of Wild, and Pasture Mine of others.

The "Black Clay Coal" of Cliviger and Marsden.

The Bassy Mine of the Littleborough and Wardle district.

Whether these thin coals are capable of correlation, we cannot say. Their development along the line mentioned seems to indicate that something might be done in this direction, but for our present purpose, which is the determination of nomenclature only, it will suffice if we point out that the Horse-pasture Seam of Towneley in the Burnley district occupies the same position as the Bassey Mine of the Littleborough and Wardle district, so that one term may prove a synonym of the other. Even if this does not prove to be the case, the term Bassy must be dropped because of its prior occupation and general application to the Salts Mine of Hall.

CONCLUSION.

After a careful consideration of the many terms local, and other applied to the coal seams of the Lower Coal Measures, those which we tabulate below seem to us the most legitimate to retain. Four of them, it will be noted, and these the most important, are linked together in a most useful way.

COAL SEAMS OF THE LANCASHIRE LOWER COAL MEASURES.

Pasture, Bassey, and other thin coals.

40 Yards, or Upper Mountain Mine.

Thin Coal (Fireclay Coal of Upholland).

Upper Foot or Bullion Mine.	} Mountain Four Feet where they unite.
Gannister or Lower Mountain	
Mine	

Lower Foot Mine.

Bassy or Salts Mine.

First Coal.

If a binomial nomenclature can be got rid of, it ought to be by the suppression of 40 Yards for Upper Mountain Mine, Bullion Mine for the Upper Foot, Gannister for the Lower Mountain Mine, and Bassy for the Salts Mine.

The succession of seams from above downward would then read thus:—

Pasture, Bassy, and other thin coals.

Upper Mountain Mine.

Fireclay Coal.

Upper Foot Mine .. } Mountain Four Feet.
Lower Mountain Mine. }

Lower Foot Mine.

Salts Mine.

First Coal.

SECTIONS SHOWING THIN COALS ABOVE THE 40 YARDS MINE.

GENERAL SECTION THROUGH THE GANNISTER BEDS, BILLINGE.

(Abridged from *Geol. Survey Memoir*, "Geology of the Country around Wigan," p. 10, 1862.) Hull.

	Ft.	In.
Strata	850	0
Upper Mountain Mine (1st Coal)	2	0
Fireclay and Shales	10	0
Coal (Fireclay Coal of Upholland), (2nd Coal) ...	0	10
Strata	290	0
Bullion Coal (3rd Coal)	0	8
Strata	46	0
Coal (Gannister), (4th Coal)	1	4
Strata	181	8
Coal (5th Coal)	1	3½
Strata	32	0
Lower Mountain Mine (6th Coal)	2	8
Strata	364	0
Millstone Grit	0	0

SECTION OF THE LOWER COAL MEASURES AT
CHARNOCK RICHARD, NEAR CHORLEY.

(Abridged from Hull's Section, *Geol. Survey Memoir*, "Geology of the Burnley Coalfield," pp. 91, 92.)

	Ft.	In.
Strata	219	0
Thin Coal	0	7
Strata	48	0
Coal (Upper Mountain Mine) average	2	4
Strata	272	0
Coal, Lower Mountain Mine (Gannister Coal)	1	6

SECTION AT TURTON COLLERY, NEAR DARWEN.

(Abridged from Hull's Section, *Geol. Survey Memoir*, "Geology of the Burnley Coalfield," p. 58, 1875.)

	Ft.	In.
Strata	51	0
Bin Coal	0	10
Strata	108	0
Coal	0	10
Fireclay	6	0
Coal, called "Half-Yard Mine"	1	8

Hull states, "It is very difficult to correlate these beds with those of the Darwen district. They are probably not identical."
Op. cit., p. 58.

SECTION OF LOWER COAL MEASURES IN THE DARWEN
DISTRICT.

(Hull, *Geol. Survey Memoir*, "Geology of the Burnley Coalfield," p. 57, 1875.)

	Ft.	In.
Coal	0	10
Strata	36	0
Yard Seam (Upper Mountain Mine)	3	0
Strata	210	0
Gannister Coal or Half-Yard Mine	1	6 to 2 ft.

"Besides the above, there is also a coal seam one foot thick, lying 18 yards above the "Half-Yard Mine at Darwen."

SEQUENCE OF STRATA AT OSWALDTWISTLE.

(Hull, *Geol. Survey Memoir*, "Geology of the Burnley Coalfield,"
p. 63, 1875.)

	Ft.	In.
Foot Seam of Coal..	0	10
Strata	36	0
Yard Mine (Upper Mountain Mine)	3	0

(Absent in some places and irregular in thickness.)

SECTION IN LOWER COAL MEASURES NEAR BLACKBURN.

(Hull, *Geol. Survey Memoir*, "Geology of the Burnley Coalfield,"
p. 64, 1875.)

	CHERRY TREE WORKS.			MILL HILL.	
	Ft.	In.		Ft.	In.
Drift and Strata	120	0	}	210	0
First Coal	1	4			
Strata	30	0			
Second Coal	1	8	....	1	10
Strata	45	0	....	60	0
Third Coal	2	3	....	3	0

Hull supposed the "Third Coal" of this section to be the Gannister.

SECTIONS IN BORINGS AT NORTHWOOD FARM, PADIHAM HEIGHTS.

(*Abridged.*)

(Hull, *Geol. Survey Memoir*, "Geology of the Burnley Coalfield,"
p. 67, 1875.)

	No. 1.			No. 2.	
	Ft.	In.		Ft.	In.
Strata	54	3	....	141	5
Coal	2	2	....	2	0
Strata	36	9	....	34	4
Coal	1	0	....	1	5
Strata	33	6	....	29	4
Coal	0	6	....	0	7
Strata	81	1	....	81	0
Coal (Gannister seam)	4	6	....	3	11

TOWNLEY COLLIERY, BURNLEY.

(Dickinson, *Trans. Manch. Geol. Soc.*, vol. iv., p. 162. 1862-3-4.)

"In the northern portion (of the Lancashire coaldfield), to which I have referred, the 40 Yards Coal is generally known as the Top Bed.

But at the Towneley Colliery, where the top bed is being worked, it is in two beds, which have been named the Cannel and Black Mines, and there is a thin coal which lies above, called the horse pasture seam."

BURNLEY DISTRICT.

(Wild, *Trans. Manch. Geol. Soc.*, vol. iv., p. 188, 1862-3-4).

Two coal seams between the Bullion and Arley Mines. "The upper (lower) one being 20 inches thick and having a fireclay shale roof, which is the seat of a very thin seam of coal a few feet above it."

SECTION AT FOX CLOUGH, COLNE.

(Wild, *Trans. Manch. Geol. Soc.*, vol. xxi., p. 380, 1890-1-2.)

	Ft.	In.
Strata	4	2
Coal and Smuts of Coal	0	7
Strata	6	3

Op. cit. CLOUGH HEAD, BRIERFIELD.

Arley Mine.

Strata, with a few thin coal seams	120	0
Coal	2	0
Strata	150	0

Upper Mountain Mine.

Strata	150	0
Mountain Four Feet (Bullion of Wild).		

GENERAL SECTION OF THE LOWER COAL MEASURES OF CLIVIGER.

(Abridged from Hull's Section, *Geol. Survey Memoir*, "Geology of the Burnley Coalfield," pp. 54, 55, 1875.)

Arley Mine (Middle Coal Measures.)

	Ft.	In.
Strata	690	0
Black Clay Coal, in two beds (6 in. to 24)	1	0
Strata	290	0
Foot Coal	1	0
Strata	21	0
Coal, 40 Yards, or Upper Mountain Mine	2	0
Strata	24	0
Coal	0	2
Strata	99	0
Gannister Coal or Mountain Mine	3	10*
Strata	30	0
Coal, Lower Foot	0	10
Strata	226	0
Coal	0	4

Rough Rock (Millstone Grit).

SECTION AT CLOUGH HEAD COAL-PIT, MARSDEN.

(Hull, *Geol. Survey Memoir*, "Geology of the Burnley Coalfield,"
p. 68.)

	Ft.	In.
Strata	120	0
1st Coal ("Black Clay Coal") 18 in. to	2	0
Various Strata	150	0
2nd Coal (Upper Mountain Mine) ..	1	5
Various Strata	150	0
3rd Coal (Gannister).. .. from 4 ft. to	6	0 Mountain 4 Ft.

SECTION OF LOWER COAL MEASURES AT TOWNHOUSE
COLLIERY, COLNE.

(1870-1-2.—Adapted from Wild's Section, *Trans. Manch. Geol.*
Soc., vol. xxi., p. 391, 1890-1-2.)

	Ft.	In.
Coal	0	9
Strata	15	0
Top Bed Coal	1	0
Strata	147	0
Coal	0	4
Strata	150	0
Bullion Coal (Mountain Four Feet)	4	2

TRAWDEN.

Various thin coals are described by Hull (*Geol. Survey Memoir*,
"Geology of the Burnley Coalfield," p. 69, 1895) as occurring in
the Trawden valley, but their relation and position are not stated.

LITTLEBOROUGH AND WARDLE DISTRICT.

	Ft.	In.
Bassy Mine of J. Dickinson.		
Strata	90	0
40 Yards or Upper Mountain Mine. <i>Op. cit.</i> , p. 59.		

BAMFORD AND ASHWORTH, NEAR ROCHDALE.

(Dickinson, *Trans. Manch. Geol. Soc.*, vol. iv., p. 161, 1862-3-4.)

	Ft.	In.
Bassy Mine.		
Strata	90	0
40 Yards Mine.		

* Mountain Four Feet.

OLDHAM.

(Abridged from Hull's Section, *Geol. Survey Memoir*, "Geology of the Country around Oldham," p. 16, 1864.)

	Ft.	In.
Arley or Royley Mine.		
Strata	14	0
Coal	0	6
Strata	825	0
Coal. 40 Yards Mine	1	4

GENERAL SECTION OF THIN COALS OF THE UPPER PART OF THE
LOWER COAL MEASURES.

(Adapted from G. Wild's Section, *Trans. Manch. Geol. Soc.*,
vol. xxi., p. 393.)

Royley or Arley Mine.	
Strata	5½ yards.
Two-inch Coal.	
Strata	4 yards.
One-inch Coal.	
Strata	29 yards 1 foot.
Half-inch Coal.	
Strata	134 yards 9 inches.
Pastures Mine.	
Strata	77 yards 2 feet.
Upper Mountain Mine.	

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